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System Logic Description for the Low-Activity Waste Facility - LAW Melter Feed Process System (LFP)

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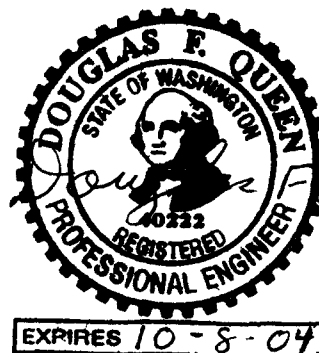
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Notice

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History Sheet

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Contents

Notice.....	ii
History Sheet	iii
Glossary	v
Acronyms and Abbreviations	vi
1 Introduction	1
2 Applicable Documents.....	1
3 Description	1
3.1 System Requirements	1

Figures

Figure 1	Level Control for Vessel LFP-VSL-00001	6
Figure 2	Level Control for Vessel LFP-VSL-00002	7
Figure 3	Level Control for Vessel LFP-VSL-00003	8
Figure 4	Level Control for Vessel LFP-VSL-00004	9

Glossary

Acquire	A command, under batch control, that reserves a group of equipment for that particular batch control.
Actual Volume	Volume of waste/process fluid in any vessel in gallons.
Available Space	Volume of waste/process fluid that any vessel can accommodate and still be lower than the upper operating limit (UOL), in gallons. Available space can be calculated as follows: <i>Available Space = UOL - Actual Volume</i> .
Available Volume	Volume of waste/process fluid that any vessel can transfer to another vessel and still be above the lower operating limit (LOL), in gallons. Available volume can be calculated as follows: <i>Available Volume = Actual Volume - LOL</i> .
Batch	The material that is being produced or that has been produced by a single execution of a batch process.
Batch Control	Control activities and control functions that provide a means to process (that is, an ordered set of processing activities) finite quantities of material over a finite period of time using one or more pieces of equipment.
Batch Process	A process that leads to the production of finite quantities of material by subjecting quantities of input material to an ordered set of processing activities over a finite period of time using one or more pieces of equipment.
Exception Handling	Those functions that deal with plant or process contingencies and other events that occur outside the normal or desired behavior of batch control.
Permissive	Interlock that allows a device to change state or a sequence to start. Once a device has changed state or a sequence has started, permissives have no further effect on the device or sequence.
Release	A command under a batch control that opens up a group of equipment for any batch control to acquire.
Trip	Interlock that does not allow a device to change state or a sequence to start. Once a device has changed state or a sequence has started, trips continue to have an effect on the device or sequence.

Acronyms and Abbreviations

AEA	Atomic Energy Act of 1954
AI	alarm indicator
DOE	US Department of Energy
HS	hand switch
LAHH	level alarm high high
LALL	level alarm low low
LAW	low-activity waste
LCP	LAW concentrate receipt process system
LFP	LAW melter feed process system
LI	level indicator
LOL	lower operating limit
LSHH	level switch high high
LSLL	level switch low low
LT	level transmitter
LY	level relay
PCJ	process control system
UOL	upper operating limit

1 Introduction

This document describes the instrument control logic for tank and ancillary equipment within the low-activity waste (LAW) facility for the LAW melter feed process system (LFP) associated with dangerous waste management. This document focuses on tank and ancillary equipment for the LFP system above the 0 ft elevation within the LAW facility.

2 Applicable Documents

WAC 173-303, *Dangerous Waste Regulations*, Washington Administrative Code, as amended.

3 Description

3.1 System Requirements

The tank and ancillary equipment associated with dangerous waste management within the LAW system and residing above the 0 ft elevation of the LFP system consists of the following:

- LFP-BULGE-00001 melter 1 feed/prep valve bulge
- LFP-BULGE-00002 melter 2 feed/prep valve bulge
- LFP-VSL-00001 melter 1 feed prep vessel
- LFP-VSL-00002 melter 1 feed vessel
- LFP-VSL-00003 melter 2 feed prep vessel
- LFP-VSL-00004 melter 2 feed vessel

3.1.1 Melter 1 Feed Prep Vessel (LFP-VSL-00001)

The melter 1 feed prep vessel (LFP-VSL-00001) is at the 2 ft elevation in an enclosed wet process C5 cell, room L-0123. The vessel receives any overflow from the melter 1 feed vessel (LFP-VSL-00002). The vessel overflows via an overflow header to the C3/C5 drains/sump collection vessel (RLD-VSL-00004) in another cell, room L-B001B, at the -21 ft elevation.

The wet process C5 cell, room L-0123, supports a stainless steel liner sized to provide secondary containment.

The melter 1 feed prep vessel (LFP-VSL-00001) is constructed of 316 stainless steel and receives treated tank farm liquid waste from the concentrate receipt vessels (LCP-VSL-00001 or LCP-VSL-00002), also at the 2 ft elevation. During a batch process glass formers are added to the waste. If the melter 1 feed prep vessel agitator (LFP-AGT-00001) receives permissives to operate, it blends the waste to form a melter feed. The vessel is vented via a vessel ventilation header into the LAW secondary offgas/vessel vent process system (LVP).

The melter 1 feed prep vessel (LFP-VSL-00001) level is continuously monitored by redundant level transmitters LFP-LT-1124 and LFP-LT-1140. The operator selects the primary transmitter. This actual level signal inputs to the functional logic and batch controls and calculates actual volume. The process control system (PCJ) monitors level to control melter feed batch transfers. As part of the batch control, the operator releases and acquires the target vessel melter 1 feed vessel (LFP-VSL-00002) or melter 2 feed vessel (LFP-VSL-00004) and initiates the transfer sequence using a melter 1 feed prep pump (LFP-PMP-00001A or LFP-PMP-00001B).

Once initiated, the PCJ system verifies that the instruments, utilities, and equipment associated with the transfer are within operational parameters. Before the sequence proceeds further, the transfer (available) volume is calculated by the PCJ system to assist the operator and verify that the volume will not overflow the selected target vessel available space. The transfer will end when either the level in the melter 1 feed prep vessel (LFP-VSL-00001) reaches its low-level functional logic control point, a batch is transferred, or the selected target vessel reaches its actual high-level batch control point. Low-low level trips will stop the melter 1 feed prep vessel agitator (LFP-AGT-00001) and melter 1 feed prep pumps (LFP-PMP-00001A or LFP-PMP-00001B).

To prevent a possible overflow, the PCJ system alarms at two different high-level setpoints. At high-level setpoint, the PCJ system initiates a high alarm and alerts the operator. At high-high level setpoint, the PCJ system initiates a critical alarm and alerts the operator. Additionally, a high-high level during a procedural transfer from another vessel will initiate exception handling to mitigate vessel overfill. Figure 1 depicts the instrumentation associated with the melter 1 feed prep vessel (LFP-VSL-00001).

3.1.2 Melter 1 Feed Vessel (LFP-VSL-00002)

The melter 1 feed vessel (LFP-VSL-00002) is at the 2 ft elevation in an enclosed wet process C5 cell, room L-0123. The vessel overflows via an overflow header to the melter 1 feed prep vessel (LFP-VSL-00001) in the enclosed wet process C5 cell, room L-0123.

The wet process C5 cell, room L-0123, supports a stainless steel liner sized to provide secondary containment.

The melter 1 feed vessel (LFP-VSL-00002) is constructed of 316 stainless steel and receives a blended melter feed of treated tank farm liquid waste from the melter 1 feed prep vessel (LFP-VSL-00001) or the melter 2 feed prep vessel (LFP-VSL-00003). The vessel is vented via a vessel ventilation header into the LVP system.

The melter 1 feed vessel (LFP-VSL-00002) level is continuously monitored by redundant level transmitters LFP-LT-1145 and LFP-LT-1146. The operator selects the primary transmitter. This actual level signal inputs to the functional logic and batch controls and calculates actual volume. The PCJ system monitors level to control melter feed batch transfers. As part of the nonmelter feed batch control, the operator releases and acquires the target melter 1 feed prep vessel (LFP-VSL-00001), melter 2 feed prep vessel (LFP-VSL-00003), or plant wash vessel (RLD-VSL-00003). The transfer sequence uses melter 1 feed vessel pump (LFP-PMP-00002).

Once initiated, the PCJ system verifies that the instruments, utilities, and equipment associated with transfer are within operational parameters. Before the nonmelter transfer sequence proceeds further, the transfer (available) volume is calculated by the PCJ system to assist the operator and verify that the volume will not overflow the selected target vessel available space. The nonmelter transfers will end

when either the level in the melter 1 feed vessel (LFP-VSL-00002) reaches its low-level functional logic control point, a batch is transferred, or the selected target vessel reaches its high-level batch control point. Low-low level trips will stop the melter 1 feed vessel agitator (LFP-AGT-00002) and melter 1 feed vessel pump (LFP-PMP-00002).

To prevent a possible overflow, the PCJ system alarms at two different high-level setpoints. At high-level setpoint, the PCJ system initiates a high alarm and alerts the operator. At high-high level setpoint, the PCJ system initiates a critical alarm and alerts the operator. Additionally, a high-high level during a procedural transfer from another vessel will initiate exception handling to mitigate vessel overflow. Figure 2 depicts the instrumentation associated with the melter 1 feed vessel (LFP-VSL-00002).

3.1.3 Melter 1 Feed/Prep Valve Bulge (LFP-BULGE-00001)

The melter 1 feed/prep valve bulge (LFP-BULGE-00001) is at the 28 ft elevation in the process cell charge floor C3 area, room L-0202. The melter 1 feed/prep valve bulge (LFP-BULGE-00001) is connected by through-floor piping to the process wet cells. The transfer pump (LFP-PMP-00001A or LFP-PMP-00001B) discharge can routinely be routed to either the melter 1 feed vessel (LFP-VSL-00002) or the melter 2 feed prep vessel (LFP-VSL-00003). Sampling capability is provided using a sampling leg off the pump discharge line to the autosampler unit (ASX-SMPLR-00012).

During off-normal operation any bulge-contained leakage will gravity drain via through-floor piping into the sump (RLD-SUMP-00030) at the 2 ft elevation in the enclosed wet process C5 cell, room L-0123.

3.1.4 Melter 2 Feed Prep Vessel (LFP-VSL-00003)

The melter 2 feed prep vessel (LFP-VSL-00003) is at the 2 ft elevation in an enclosed wet process C5 cell, room L-0124. The vessel receives any overflow from the melter 2 feed vessel (LFP-VSL-00004). The vessel overflows via overflow line to the C3/C5 drains/sump collection vessel (RLD-VSL-00004) in another cell, room L-B001B at the -21 ft elevation.

The wet process C5 cell, room L-0124, supports a stainless steel liner sized to provide secondary containment. The welded vessel, process cell secondary containment, and the overflow system meet the requirement to minimize system leaks.

The melter 2 feed prep vessel (LFP-VSL-00003) is constructed of 316 stainless steel and receives treated tank farm liquid waste from the concentrate receipt vessels (LCP-VSL-00001 or LCP-VSL-00002), also at the 2 ft elevation. During a batch process glass formers are added to the waste. If the melter 2 feed prep vessel agitator (LFP-AGT-00003) receives permissives to operate, it blends the waste to form a melter feed. The vessel is vented via a vessel ventilation header into the LVP system.

The melter 2 feed prep vessel (LFP-VSL-00003) level is continuously monitored by redundant level transmitters LFP-LT-2124 and LFP-LT-2140. The operator selects the primary transmitter. This actual level signal inputs to the functional logic and batch controls and calculates actual volume. The PCJ system monitors level to control melter feed batch transfers. As part of the batch control, the operator releases and acquires the target vessel melter 1 feed vessel (LFP-VSL-00002) or melter 2 feed vessel (LFP-VSL-00004) and initiates the transfer sequence using a melter 2 feed prep pump (LFP-PMP-00003A or LFP-PMP-00003B).

Once initiated, the PCJ system verifies that the instruments, utilities, and equipment associated with the transfer are within operational parameters. Before the sequence proceeds further, the transfer (available) volume is calculated by the PCJ system to assist the operator and verify that the volume will not overflow the selected target vessel available space. The transfer will end when either the level in the melter 2 feed prep vessel (LFP-VSL-00003) reaches its low-level functional logic control point, a batch is transferred, or the selected target vessel reaches its high-level batch control point. Low-low level trips will stop the melter 2 feed prep vessel agitator (LFP-AGT-00003) and melter 2 feed prep pump (LFP-PMP-00003A or LFP-PMP-00003B).

To prevent a possible overflow, the PCJ system alarms at two different high-level setpoints. At high-level setpoint, the PCJ system initiates a high alarm and alerts the operator. At high-high level setpoint, the PCJ system initiates a critical alarm and alerts the operator. Additionally, a high-high level during a procedural transfer from another vessel will initiate exception handling to mitigate vessel overfill. Figure 3 depicts the instrumentation associated with the melter 2 feed prep vessel (LFP-VSL-00003).

3.1.5 Melter 2 Feed Vessel (LFP-VSL-00004)

The melter 2 feed vessel (LFP-VSL-00004) is at the 2 ft elevation in an enclosed wet process C5 cell, room L-0124. The vessel overflows via an overflow header to the melter 2 feed prep vessel (LFP-VSL-00003) in the enclosed wet process C5 cell, room L-0124.

The wet process C5 cell, room L-0124, supports a stainless steel liner to provide secondary containment.

The melter 2 feed vessel (LFP-VSL-00004) is constructed of 316 stainless steel and receives a blended melter feed of treated tank farm liquid waste from the melter 1 feed prep vessel (LFP-VSL-00001) or the melter 2 feed prep vessel (LFP-VSL-00003). The vessel is vented via a vessel ventilation header into the LVP system.

The melter 2 feed vessel (LFP-VSL-00004) level is continuously monitored by redundant level transmitters LFP-LT-2145 and LFP-LT-2146. The operator selects the primary transmitter. This actual level signal inputs to the functional logic and batch controls and calculates actual volume. The PCJ system monitors level to control melter feed batch transfers. As part of the nonmelter feed batch control, the operator releases and acquires the target melter 1 feed prep vessel (LFP-VSL-00001), melter 2 feed prep vessel (LFP-VSL-00003), or plant wash vessel (RLD-VSL-00003). The transfer sequence uses melter 2 feed vessel pump (LFP-PMP-00004).

Once initiated, the PCJ system verifies that the instruments, utilities, and equipment associated with the transfer are within operational parameters. Before the nonmelter transfer sequence proceeds further, the transfer (available) volume is calculated by the PCJ system to assist the operator and verify that the volume will not overflow the selected target vessel available space. The nonmelter transfers will end when either the level in the melter 2 feed vessel (LFP-VSL-00004) reaches its low-level functional logic control point, a batch is transferred, or the selected target vessel reaches its high-level batch control point. Low-low level trips will stop the melter 2 feed vessel agitator (LFP-AGT-00004) and melter 2 feed vessel pump (LFP-PMP-00004).

To prevent a possible overflow, the PCJ system alarms at two different high-level setpoints. At high-level setpoint, the PCJ system initiates a high alarm and alerts the operator. At high-high level setpoint, the PCJ system initiates a critical alarm alert the operator. Additionally, a high-high level during

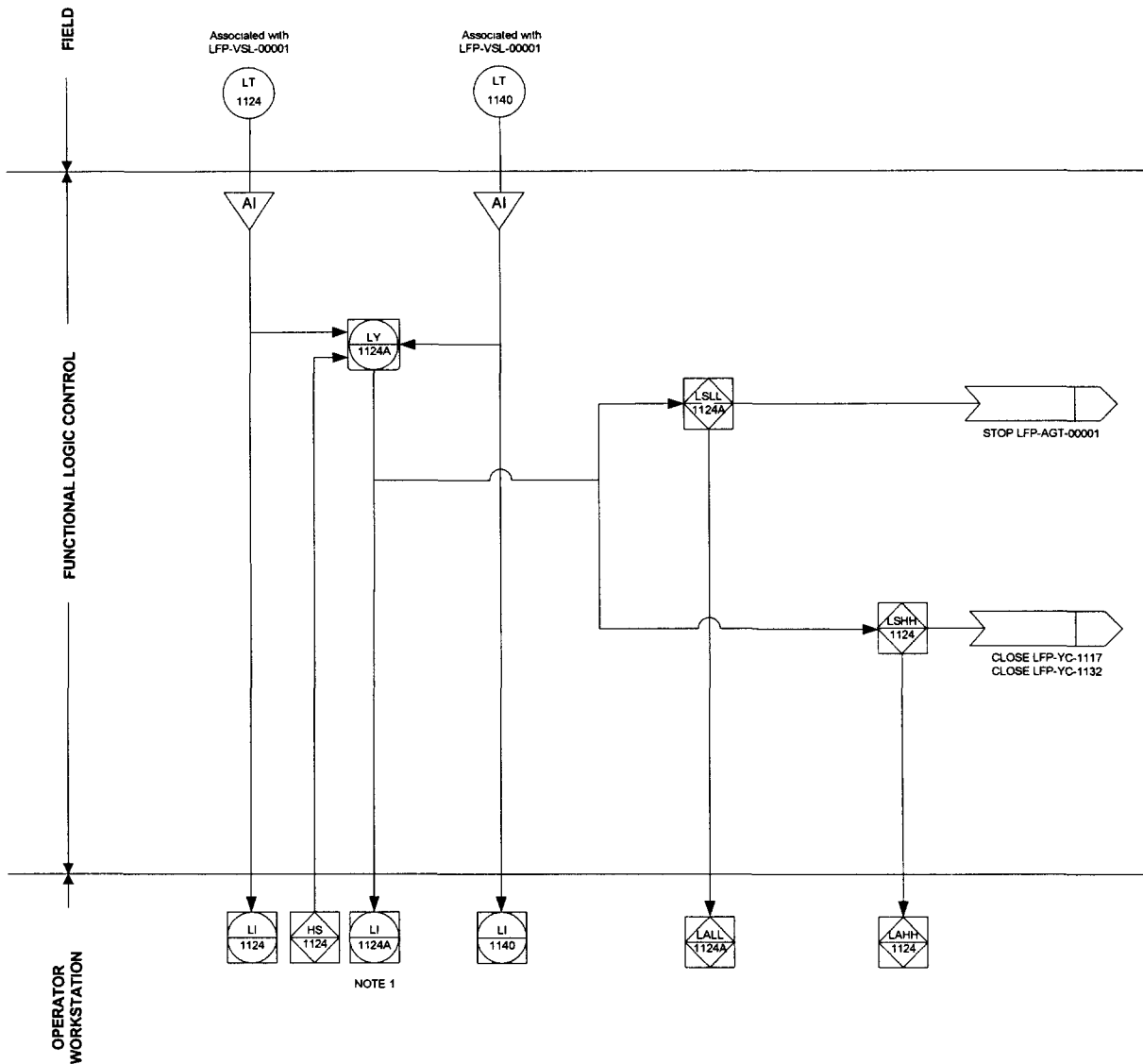
a procedural transfer from another vessel will initiate exception handling to mitigate vessel overflow. Figure 4 depicts the instrumentation associated with the melter 2 feed vessel (LFP-VSL-00004).

3.1.6 Melter 2 Feed/Prep Valve Bulge (LFP-BULGE-00002)

The melter 2 feed/prep valve bulge (LFP-BULGE-00002) is at the 28 ft elevation in the process cell charge floor C3 area, room L-0202. The melter 2 feed/prep valve bulge (LFP-BULGE-00002) is connected by through-floor piping to the process wet cells. The transfer pump (LFP-PMP-00003A or LFP-PMP-00003B) discharge can routinely be routed to either the melter 2 feed vessel (LFP-VSL-00004) or the melter 1 feed prep vessel (LFP-VSL-00001). Sampling capability is provided using a sampling leg off the pump discharge line to the autosampler unit (ASX-SMPLR-00012).

During off-normal operation any bulge-contained leakage will gravity drain via through-floor piping into the sump (RLD-SUMP-00032) located at the 2 ft elevation in the enclosed wet process C5 cell, room L-0124.

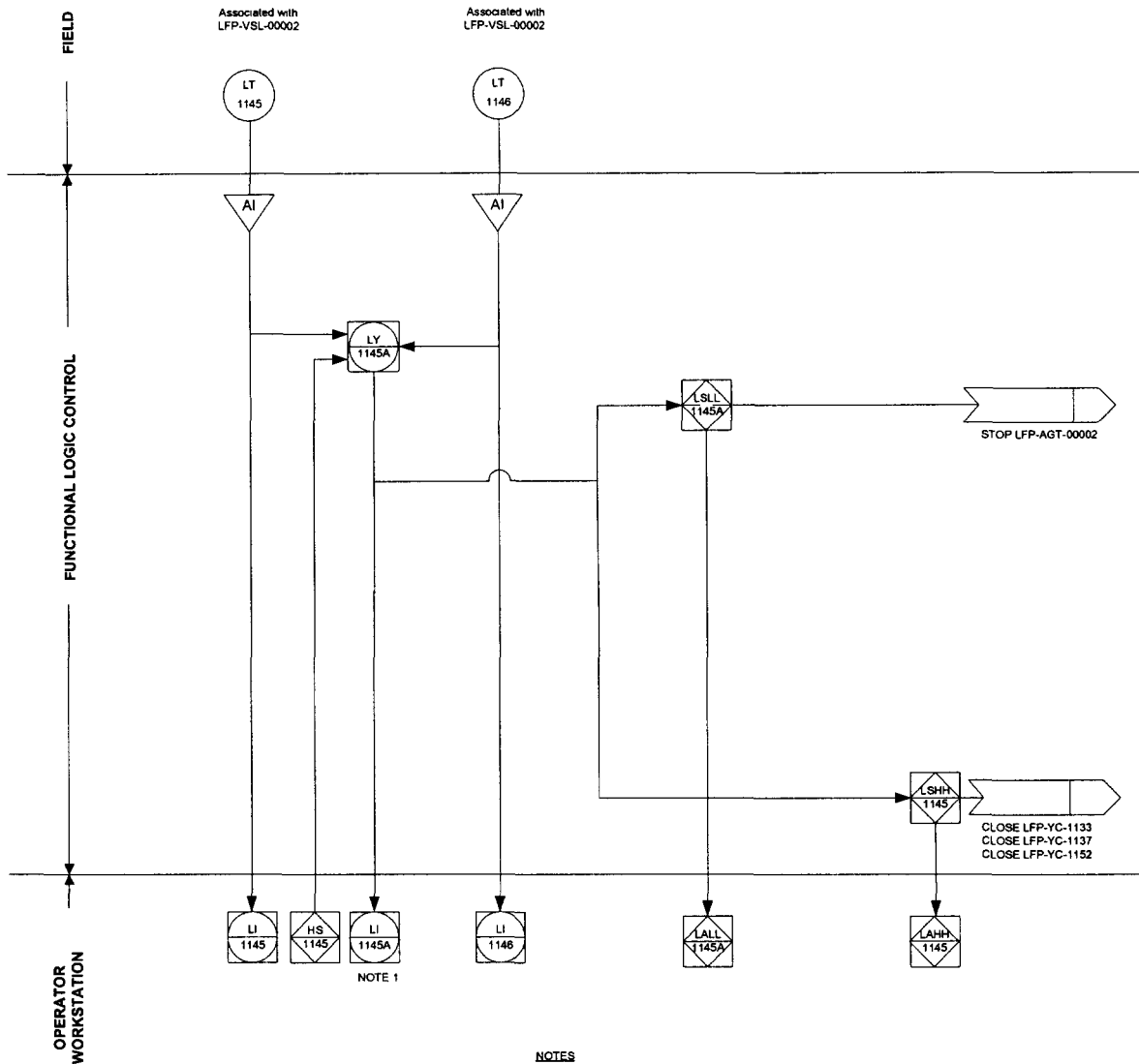
Figure 1 Level Control for Vessel LFP-VSL-00001



NOTES

1 ON HIGH-HIGH LEVEL PCJ CONTROL SYSTEM BATCH CONTROL SHALL ASSIST OPERATOR TO PREVENT VESSEL OVERFILL

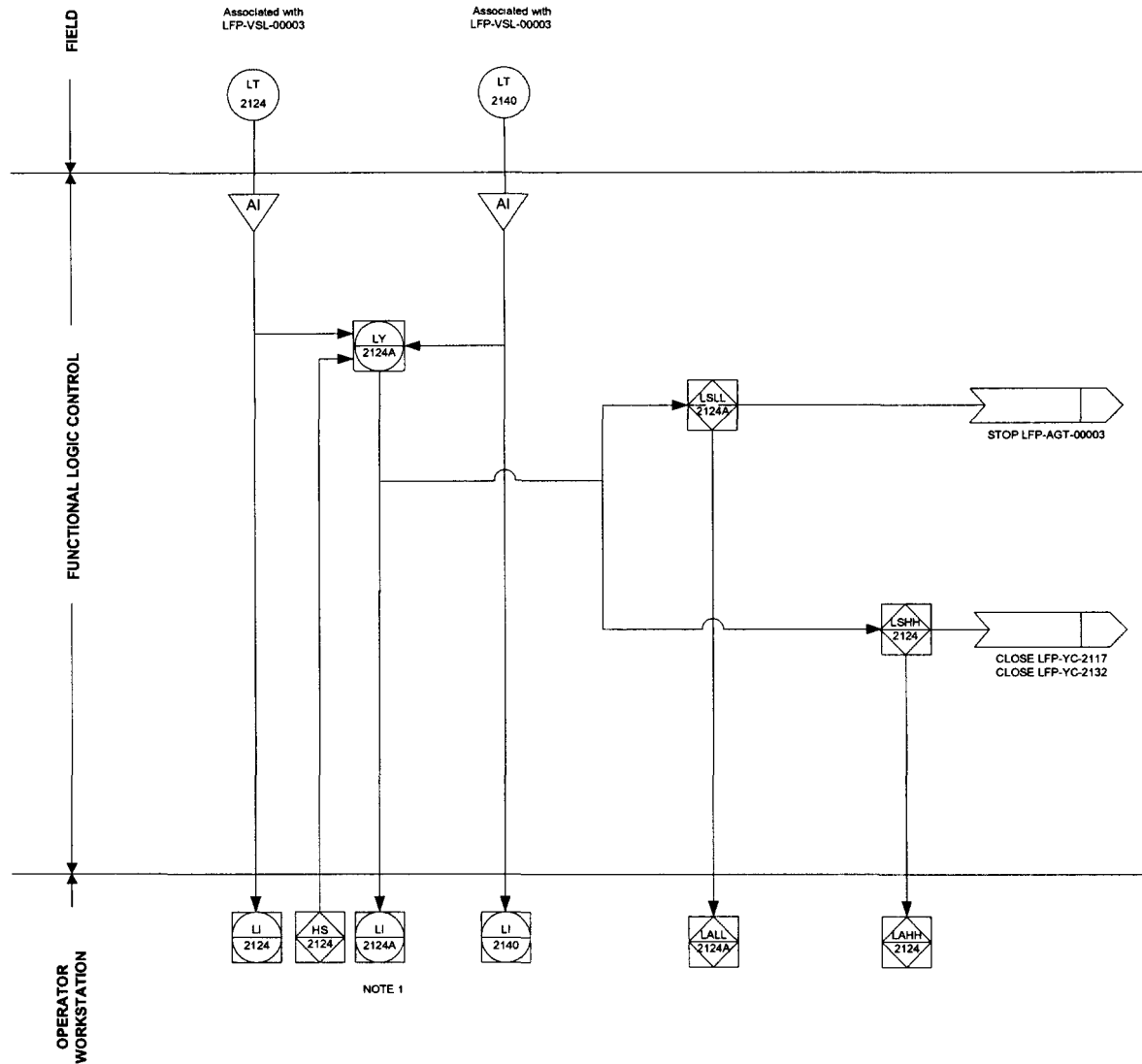
Figure 2 Level Control for Vessel LFP-VSL-00002



NOTES

1 ON HIGH-HIGH LEVEL PCJ CONTROL SYSTEM BATCH CONTROL SHALL ASSIST OPERATOR TO PREVENT VESSEL OVERFILL

Figure 3 Level Control for Vessel LFP-VSL-00003



NOTES

1 ON HIGH-HIGH LEVEL PCJ CONTROL SYSTEM BATCH CONTROL SHALL ASSIST OPERATOR TO PREVENT VESSEL OVERFILL

Figure 4 Level Control for Vessel LFP-VSL-00004

